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would be, that there is a place for a special group of future realities where other than scientific factors will be active, but this domain would then fall outside of the scope of science.

ALBERT SCHINZ.

BRYN MAWR, PA.

A STRANGE APPLICATION OF MATHEMATICAL PROBABILITIES.

Poincaré concludes his lectures on the calculus of probabilities¹ at the Faculté des Sciences of Paris with the following skeptic statement: "The calculus of probabilities offers a contradiction in the terms itself which serve to designate it, and, if I would not fear to recall here a word too often repeated, I would say that it teaches us chiefly one thing: i. e., to know that we know nothing."

This opinion of the great French scientist applies in particular to the so-called moral sciences which Condorcet, Poisson, and many other, including even Laplace, attempted to improve by the theory of probabilities. Most of these applications are, as Stuart Mill said, the scandal of mathematics.

In the lines which follow, the writer presents a recent example of this kind, which in his opinion is worse than any of those proposed by Condorcet.

In Professor Lehmann's² book on *Aberglauben und Zauberei* (German translation by Dr. Peterson, published by F. Enke, Stuttgart, 1898) on pages 440 and 461, the following statements may be found:

At the first international congress for experimental psychology at Paris, 1889, it was decided to gather statistics and reports on hallucinations. The result of this collection has now been published in two interesting books. One was published by a committee of the Society for Psychical Research, under the direction of Professor Sidgwick, and has the title, "Report on the Census of Hallucinations," Vol. X. of *The Proceedings of the S. P. R.* (date of publication is not given by Dr. Lehmann). The other, *Ueber Trugwahrnehmungen*, was published by Parish (Leipzig, 1894). In the first report, according to Dr. Lehmann, it is stated that "in England and Wales the annual death-rate since the last ten years was 19.15 out of a 1000. If every year 19 die out of a 1000, 19 die every day out of 365,000, or, in other words, 1 out of 19,000. This number $\frac{1}{19000}$ indicates the probability that a person dies on the very day when his body is seen in a hallucination, provided there is no connection between the two events. It may therefore be expected that out of 19,000 hallucinations one will occur during the hour corresponding to the time of death of the person which is due according to the statistics. After the committee had discarded all doubtful cases and taken account of many forgotten

¹ *Calcul des probabilités*, G. Carré, Paris, 1896.

² Director of the Psychophysical Laboratory of the University of Copenhagen.

hallucinations, it obtained the result that out of 1300 hallucinations¹ of living persons, 30 persons died 12 hours before or after those 30 respective hallucinations. This gives for the actual probability of the coincidence of hallucinations and cases of death $30:1300 = 1:43$, while the theoretical probability is $1:19000$; the real number is therefore 440 times greater. Consequently, there must be a special cause for this coincidence." . . .

Now let us see upon what assumptions this remarkable conclusion is based. There is no doubt that $\frac{1}{19000}$ is the approximate probability that out of 19,000 persons in England and Wales a certain one will die on the day considered. This probability can be no other probability and it seems absurd to link it with the entirely different problem of hallucinations which has nothing to do with the mortality of a country. In fact, the number $\frac{1}{19000}$ could be applied to the statistics of hallucinations only when every inhabitant of England and Wales would have one hallucination per day. Furthermore, those 1300 hallucinations are presumably scattered over periods of weeks, months, and years, so that also for this reason it is impossible to make a reasonable comparison of a probability resulting from events which occurred during several years, with a probability limited to one day. The probability of life and death as considered in statistical computations is entirely different from that resulting from hallucinations and deaths. Finally it makes a very great difference whether the 30 cases of death occur within or without the circle of 1300 persons having hallucinations. Hence, the comparison of the two probabilities cannot be justified, and the conclusion that a certain unknown cause produces said probability of $\frac{1}{43}$ is illusory.

According to the data of the Sidgwick Committee, $\frac{1}{43}$ is the probability that a hallucination will come true. This probability is quite small. To indicate a definite cause for the coincidence of hallucinations and death, the probability would have to be at least $\frac{1}{2}$. The probability of $\frac{1}{43}$ is therefore rather a disproof for a certain cause, and I should describe it as an accidental synchronism.

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¹ It is not stated what kind of hallucinations.